



جامعة صنعاء
كلية الطب والعلوم الصحية
دائرة العلوم السريرية الطبية
دفعة بصمة طبيب 31
طب بشري

OPHTHALMOLOGY



Anatomy & Examination of the eye

Lecture No. **1**

د. توفيق الخطيب

Written by : **ضياء الحق الصريمي**

اللجنة العلمية لدفعة بصمة طبيب 31

مندوب الدفعة
عبد الرحمن العديني

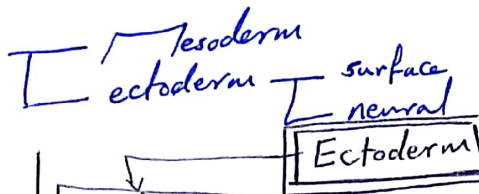
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جولة الجامعة الجديدة تلفون 212863-777447225

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Part one $\Rightarrow$ Anatomy

- the eye arise from two layers



- Mesoderm give the following:-

- Cornea
- sclera
- choroid
- iris & ciliary body except the pigmented epithelium
- Extraocular muscles.

MCA

Surface ectoderm

- skin of the eyelid
- lacrimal apparatus
- Conjunctiva
- epith. of Cornea
- Crystalline lens

Ectoderm

Neural ectoderm

- Retina
- optic nerve
- pigmented epithelium of iris & ciliary body
- Sphincter & dilator pupillae muscles
- « muscles of iris »

Note:- Cornea arises from two structures $\Rightarrow$ surface ectoderm & mesoderm.

Dimension of the eyeball

- anteroposterior diameter 24 mm.
- lateral (Horizontal) diameter 23,5 mm.
- Vertical diameters $\rightarrow$ 23 mm
- Circumference $\rightarrow$ 75 mm
- volume $\rightarrow$ 6,5 ml.
- weight $\rightarrow$ 7 g

oral

* equator: imaginary line divide the eyeball into ant. segment & post. segment
it is 12 mm from limbus

The anatomy of the eye divide into three parts: ① Bony orbit
② Adnexia
③ eyeball itself

Orbital cavity $\rightarrow$ is pair of large pear-shaped Bony socket.
each cavity is composed of 7 bones & 4 walls

7 Bones

- 1 Frontal
- 2 sphenoid
- 3 lacrimal
- 4 ethmoidal
- 5 palatine
- 6 zygomatic
- 7 maxillary

4 walls

- 1 Roof
- 2 Floor $\Rightarrow$ is the weakest
- 3 Medial $\Rightarrow$ is the thinnest
- 4 Lateral $\Rightarrow$ is the strongest.

$\Rightarrow$ orbit: ① houses the eye
② protect the eye
③ attachment site for extrinsic muscles.

- Lateral wall $\equiv$ zygomatic bone, greater wing of sphenoid,
- Medial wall $\equiv$ body of sphenoid, ethmoid bone, Frontal process of maxillary and lacrimal bone.
- Floor $\equiv$ zygomatic, maxillary and palatine bone.
- roof $\equiv$ orbital plate of frontal bone, lesser wing of sphenoid.

Note: Sphenoid share in three walls except Floor.

↓ anteriorly

↓ posteriorly

☒ The orbital cavity has three $\equiv$ Connection with the brain

[1] Optic canal [2] Superior orbital Fissure [3] inferior orbital Fissure

Q Draw and label the superior orbital fissure & the structures pass through it?

Q What are the structures inside or within the Annulus of Zinn?

Optic Canal structures

- [1] Optic nerve
- [2] ophthalmic artery
- [3] meninges

- Superior orbital Fissure -

Live $\Rightarrow$ lacrimal n

Free $\Rightarrow$ Frontal n

To $\Rightarrow$ trochlear n

See $\Rightarrow$ superior division of ophthalmic n

No $\Rightarrow$ nasociliary nerve

Insult $\Rightarrow$ inferior division of ophthalmic n

at All $\Rightarrow$ Abducent nerve.

ضمائم العين

ضمائم العين

☒ Adnexia means the structures surrounding the eyeball.

[1] eyelid $\Rightarrow$ Composed of $\Rightarrow$ ① skin

[2] Conjunctiva

[3] Lacrimal apparatus

[4] E.O.

② Subcutaneous tissue

③ muscle fibre of orbicularis oculi

④ orbital septum and tarsal plate

$\rightarrow$ skeleton of the eye

⑤ Smooth muscle

⑥ Conjunctiva.

Conjunctiva: very thin mucous membrane line the eyelid and is reflected at the superior & inferior Fornices into the anterior surface of the eyeball.

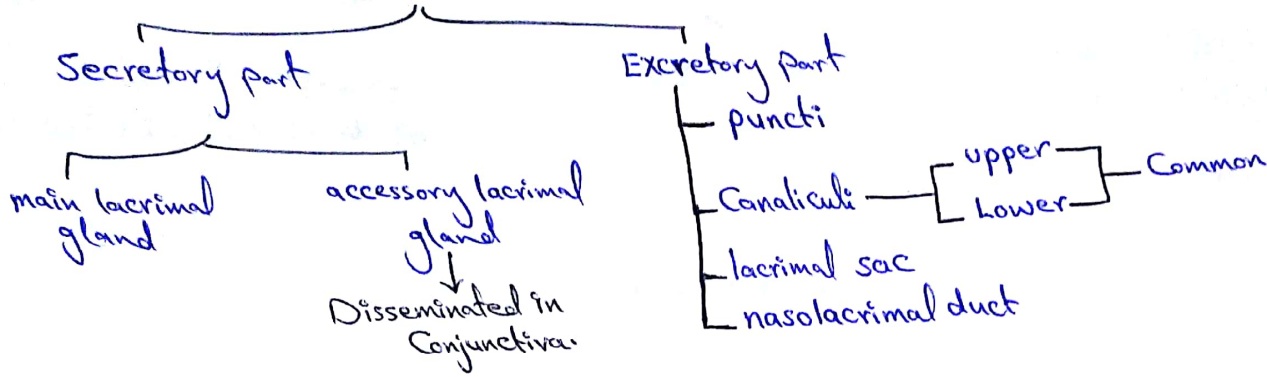
$\rightarrow$ Divided into

- [1] Palpebral Conj.
- [2] Conjunctival Fornices
- [3] Bulbar Conjunctiva
- [4] plica semilunaris
- [5] Caruncle

these are the main types.

❑ Lacrimal apparatus:-

two parts



❑ Extraocular muscles | E.O.M

6 E.O.M → 4 Recti and we should know the [origin, insertion, action, Blood supply, Nerve supply] of each one.

- origin →

* All the muscles take origin from the apex of the orbit from Annulus of Zinn except the inferior oblique muscle take from the floor of orbit.

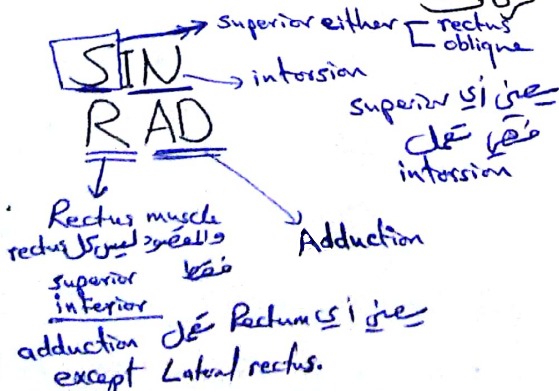
Eye movement term:-

- + Duction :- movement of one eye itself
- + Version :- movement of the 2 eyes in the same direction.
- + Adduction :- eye looks toward the nose
- + Abduction :- eye looks toward the ear
- + Dextroversion :- both eyes look to the right side
- + Levoversion :- both eyes look to the left side
- + Supraversion :- both eyes upgaze
- + Infraversion :- downgaze.



- insertion → All four rectus muscles inserted on sclera at following distances from the limbus:
 - medial 5.5 mm
 - lateral 6.9 mm
 - inferior 6.5 mm
 - superior 7.7 mm
- inferior oblique → inserted on sclera posterior to the equator
- superior oblique → " in the upper & outer part of the sclera behind the equator
- nerve supply → All supplied by 3rd (oculomotor nerve) except ① Sup. oblique → 4th CN Sot4
② Lateral rectus → 6th CN

- Action التوجيهات الجارية للعينين



Muscle	Primary action	secondary action	Tertiary action	Ref.
IR	Adduction	—	—	"Inferior Oblique"
LR	Abduction	—	—	
SR	Elevation	Intorsion	Adduction	
IR	Depression	<u>Extorsion</u>	Adduction	
SO	Intorsion	Depression	Abduction	
IO	<u>Extorsion</u>	Elevation	Abduction	

The eyeball

Site $\Rightarrow$ Bony cavity
Shape $\Rightarrow$ spherical
Diameter $\Rightarrow$ 24 mm
Weight $\Rightarrow$ 7 Gram.

Equator: imaginary line midway between ant. and posterior poles 12 mm posterior to the limbus.

Refractory media

- ① Cornea 1,37
- ② Aqueous 1,33
- ③ Lens 1,42-1,39
- ④ Vitreous 1,33

Refractive power

- Cornea 42 D
- Lens 18 D

Comprises of : ① Tough outer coat — 2 Cornea + Sclera
② Rich vascular coat — 3 Iris + ciliary body + Choroid
③ Nervous coat — 1 Retina

Chambers of the eyeball $\Rightarrow$ ① Ant. chamber: between the iris & the cornea
② Post. chamber: between the iris & the lens.

Ques:- What are the Causes of shallow or deep A.C? glaucoma Lec.
What makes the Cornea transparent? Cornea Lec.

Cornea avascular transparent dome-shaped window with more nerve endings than anywhere in the body that's why corneal ulcer is very painful

* Sources of nutrition of Cornea

- 3 main sources ① air oxygen
② Blood vessels around the limbus
③ aqueous humour.

Sclera white of the eye tough opaque tissue act as protective layer

Pupil - opening in the center of iris
- size of the pupil determine the amount of light enters the eye.
- Controlled by $\begin{cases} \rightarrow \text{dilator muscle of iris} \rightarrow \text{sympathetic innervation} \\ \rightarrow \text{sphincter muscle of iris} \rightarrow \text{parasympathetic innervation.} \end{cases}$

Iris - Coloured part of eye $\Rightarrow$ Iris print ~~iris print~~
due to the colour texture and patterns of each person's iris are as unique as a fingerprint

Ciliary body - Behind the iris
- suspend the lens by fiber ligaments [Zonules]
- produce the aqueous humor

4 - Control accommodation to light by change the shape of the lens.
When relax & Zonules Contract $\rightarrow$ lens become thinner $\Rightarrow$ focus for distance vision
والعين البعيدة

Lens - located just behind the iris
 - Focus light onto the Retina
 - transparent

Retina - lines the back of eye
 - Retina developmentally arise from 2 layers or (sources)
 ① - inner cup of the optic disc
 ② - outer cup of the optic disc.

So in Retinal detachment RD $\Rightarrow$ separation of retinal pigmented epithelium from from the other neurosensory part of the Retina.

- Contain photoreceptors ① Cones 6 million Bright light central site

Function: Capture light rays & convert them into electrical impulses.
 ② Rods 125 million night vision peripherally

The Ocular Blood Supply:

- How many branches supply the eye?

$\rightarrow$ 11 branches $\rightarrow$

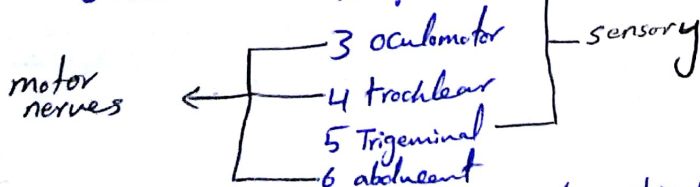
ophthalmic artery branch of
 internal carotid artery branch of
 common carotid artery

- ① central artery of Retina
- ② lacrimal artery
- ③ muscular artery
- ④ short posterior ciliary artery
Long posterior ciliary artery
- ⑤ Ant. ethmoidal artery
- ⑥ Post. ethmoidal artery
- ⑦ supraorbital artery
- ⑧ supratrochlear artery
- ⑨ medial palpebral artery
- ⑩ lateral palpebral artery
- ⑪ Dorsal nasal artery

Q What are the structures that form the angle of A.C? $\rightarrow$ ghama Lec.

The Orbital nerves:- We have 12 CNs half of them share in supplying the eye.

6 nerves $\Rightarrow$ 2 optic



and Autonomic supply $\rightarrow$ sympathetic
 parasympathetic

فصل 10
 Essay - oral

Part two

History and examination of eye

- In history $\rightarrow$ as we do in other branches
start by: Name Age sex Address
occupation

- Some diseases Common in (age group) $\Leftarrow$ Age
- Some " " in area $\Leftarrow$ Address
- " " " " certain job $\Rightarrow$ occupations

In ophthalmic department 99% of Cases diagnosed in the clinic not need investigation, depend on the skills of the doctors.

- Personal Hx
- C.C + duration
- History of present illness
- Past ocular Hx
- Past medical Hx
- Drug H
- Family H
- Allergy

Note: * in eye examination take the eye as a whole not to see if there is Cataract or not.

* Always examine both eyes

PHYSIOLOGICAL TESTING OF THE EYE:-

I] Visual acuity:-

- examine for far & for near
- examine both eyes
- not to press on the eye. $\Rightarrow$ give false test or Results.

there is many charts to do this test as Snellen's chart test.

المريض يقف على بعد 6 متر ويقرأ العين الأيسر الأيمن ويسأل من قبل الحرف الكبير إلى الصغير من أعلى إلى أسفل.

إذا كان من إجابات من طرف يقرأ أول حرف تقليد يقرب متر إلى أن يصل إلى مافت [Arm distance] نبدأ

نؤمّن له بحركات [Hand motion] إذا لم يري

نجيب بصوت [light perception] إذا لم يصف بصوت

فهذا يسمى [blind] أنما

مثال إذا تخبره 6/24 فماذا يعني هذا الرقم؟

معنى هذا أن الشخص معرّف defect فالرقم الذي من المفروض أن يصف على بعد 24 متر صاف على بعد 6 أمتار.

- * Test for near vision :- - done usually to the old pt.
- the distance is thirty three 33 cm.

[2] Visual field

- in neurological disorders & glaucoma.
- Examine glaucoma by 3 test or parameters:-

oral

- ① Visual field
- ② intraocular pressure
- ③ Cup / disc ratio

* Confrontation test

* Perimeters

[3] Intraocular Pressure:-

- Any person above 40 years should measure the Intraocular pressure. I.O.P
- There is a way to know if the pressure is high or low by Digital palpation test [like fluctuation test] press by one finger & feel by the other finger
 - Goldmann Applanation tonometry. no ref

[4] Pupillary reaction

Q What is the surest sign of death?

Fixed dilated pupil

We focus on 3R of normal pupil [Round - Regular - Reactive]

Q1 What are the Causes of mydriasis? auto dilate → systematically والاجابة
Q2 What are the Causes of miosis? Tup → physiological causes
[pharmacologically local systemic]
[Pathologically]

ANATOMICAL EXAMINATION OF THE EYE:-

[1] External examination:

- ① Head and Face → big head → hydrocephalus → papilledema → increase intraocular pressure
- ② Bony orbit → proptosis, enophthalmos - fracture - emphysema.
- ③ Adnexia → eyelids → ptosis, ectropion - entropion - swelling --
→ Lacrimal apparatus → visible or not, palpable or not, Regurgitation test.
→ Conjunctiva → Redness, Hemorrhage
→ E.O.M → Restriction of movement or not.

[4] EYEBALL

Cornea → opacity - keratoconus - ulcer - F.B
Sclera → inflammation scleritis - colour of sclera
Anterior Chamber → shallow or deep - & the content of A.C.
IRIS → Pattern of the iris.
pupil → constricted or dilated.
Lens → cataract, dislocation, subluxation.

* Slit lamp by microscopy

A.C = Anterior chamber

two parts $\rightarrow$ Source of light
 $\rightarrow$ lens $\Rightarrow$ magnification

[A] used to examine $\rightarrow$ all the structures of the anterior segment of the eye
Start from [lid - Conjunctiva - Cornea - sclera - A.C - lens - iris - pupil]
and the vitreous & Retina we can examine them by slit lamp by adding lenses. Otherwise we examine the fundus by ophthalmoscope.

[2] Internal Examination

Fundoscopy: used to see 4 things

- ① macula.
- ② optic disc.
- ③ Blood vessels.
- ④ Retinal background.

Red Reflex $\rightarrow$ red colour in the pupillary area seen only by direct or indirect ophthalmoscope not by the torch.

Q What are the situations in which we can't do ophthalmoscope?

- 1 - Cataract
- 2 - Corneal opacity
- 3 - vitreous hemorrhage
- 4 - hyphema in anterior chamber.

That's mean the visual pathway that start by Cornea $\rightarrow$ A.C $\rightarrow$ lens
 $\rightarrow$ vitreous liquid.

if there is something in this pathway we cannot see the fundus so don't do fundoscopy

So first do the Red Reflex if present do fundoscopy, if absent don't do fundoscopy.

* There is no explanation to the technique of the way of doing fundoscopy the right eye of pt with the Rt eye of doctor it is just a technique

[3] Espatial Examination Technique

- ① Diagnostic lens $\rightarrow$ Gonioscope lens. $\Rightarrow$ see angle of A.C.
- ② Retinoscopy.

4 Investigative technique

- ① U/S $\Rightarrow$ there is 2 types - $\begin{cases} A \Rightarrow \text{measure the Anteroposterior length of the eye.} \\ B \Rightarrow \text{for pathology of the Retina} \end{cases}$
- ② Keratometry $\Rightarrow$ device to measure the dimensions of Cornea.
as in cases of Keratoconus

③ Synaptophore $\rightarrow$ to asses & to diagnose the cases of squint.
 $\rightarrow$ Diagnostic & therapeutic.

④ Exophthalmometer $\rightarrow$ measure the degree of proptosis

⑤ Electrophysiological tests:-

⑥ Radiological imaging techniques

⑦ Fluorescein Angiography - used in many cases

locally for $\downarrow$ injectable
Corneal ulcer
Wound leakage
lacrimal surgery
to see BV in the Retina

أسئلة ركز عليهم الدكتور في الامتحان :-
بالإضافة لما ذكر سابقاً

① Signs of Pseudophakia?

② Signs of Aphakia? $\Rightarrow$ اختلال في الرؤية

③ Difference between direct & indirect ophthalmoscope?

④ What are the Causes of $\rightarrow$ ① mydriasis
② miosis?

⑤ What makes the Cornea transparent?

- peculiar arrangement of Corneal lamellae
- Avascularity of Cornea
- Relative dehydration maintained by active bicarbonate pump of endothelium.
- Swelling pressure of stroma
- Corneal crystalline $\Rightarrow$ water soluble proteins of Keratocyte

أهم فرق ذكره الدكتور ان

In Direct $\Rightarrow$ use one eye

In indirect $\Rightarrow$ use two eyes $\Rightarrow$ give advantage of stereopsis depth of focus
if there is mass or tumors you see 3 Dimention image.

لبناء الحق البصري